REMARKS

The Office Action indicated that the subject matter of Claims 25 and 26 would be allowed if they were re-written in independent form. Applicant appreciates the indication of allowable subject matter in this application, but would request that the re-writing of such claims be held in abeyance until the following is considered by the Examiner.

As indicated in the cited prior art, the formation of flat panel displays, including plasma display panels, has been addressed by a number of highly skilled engineers and scientists in an effort to make an efficient and economical product. As further noted in our specification on Page 2, plasma display panels are frequently manufactured by applying silver paste to the respective front and back glass substrates and securing them by baking. Protective layers can be applied and barrier ribs can also be formed by applying glass paste with a subsequent baking procedure.

Subsequently, phosphor paste is applied to the barrier ribs and can be baked at an elevated temperature to remove the organic binders. After the phosphor has been appropriately baked, a sealing material, such as a glass frit, is applied to the outer region of the substrate and is further baked to remove resin and other elements in a temporary baking process. Then, the front glass substrate and the back glass substrate are stacked together and bonded by heating at a temperature higher than the softening point of the sealing glass.

The panel that is now bonded together can then be further heated while gases are exhausted between the substrates as a preparatory step for receiving a discharge gas that is to be supplied to the internal space at a set pressure.

The present invention increases the light emitting efficiency and the color purity, while addressing the cost of the production process. To achieve these purposes, the present invention

provides a pre-baking of a phosphorous layer and applies a sealing material to a peripheral region of a substrate. The front and back substrates are then stacked together to face each other in an operative manner and a single baking step is then provided for heating both the front and back substrates to evaporate any organic binder, while at the same time, supplying a dry gas containing oxygen to an internal space that is formed between the front and back substrates. These steps are set forth in independent Claims 1 and 16.

The present front and back substrates can be inserted into a single oven and heated, while a dry gas containing oxygen is circulated in the internal space. Thus, the phosphorous material and the protective layers, such as magnesium oxide, are not exposed to high temperature or high density gases with contaminants, and it becomes possible to prevent a deterioration of the phosphorous material and the protective layers. During the heating process, any gases that have been absorbed on the surfaces of the substrates can be released and the gases will be exhausted with the cycling of the dry gas in the internal spaces.

It is possible with our invention to use a single furnace for enabling the phosphorous layer to be pre-baked, the sealing material to be preliminarily baked, and the bonding process to occur. Such a production process reduces both the time and energy required for production, and further reduces the cycling of phosphors to repeated applications of high heat. As a result, it is possible to provide a plasma display panel having a high light emitting intensity and chromaticity.

The plasma display panels of the present invention can be produced in an efficient manner while protecting both the phosphors and protective layers from being exposed to both high temperature and high density gases that may be released as the result of burning residue of the binders.

Referring to Claim 1, a baking step heats both the front and back substrates to incinerate the organic binder material, while simultaneously supplying a dry gas containing oxygen to the internal space formed between the front and back substrates. Claim 16 also defines a baking step for burning the organic binder by heating both the front and back substrates while separately disposed in the furnace, and then bonding the front and back substrates to face each other with the sealing material.

The Office Action contended that the Narayanan, et al. U.S. Patent No. 6,113,450 completely anticipated each of the claim elements of Claims 1-24 and 27-37 under 35 U.S.C. Section 102. Applicants respectfully traverse this assertion.

The Narayanan, et al. reference recognized the problems associated with the production of flat panel displays and particularly the problems associated with the use of glass frit bars which are used to seal the front and back substrates. Narayanan, et al. noted that frequently defective seals result and that even air bubbles can be formed if air is trapped between adjoining glass fit bars. Additionally, Narayanan, et al. noted the high cost in manufacturing glass frit bars and that the prior art had used a ball and mill grinding process that could require 16 hours or more of grinding that, in itself, will introduce high levels of contaminants into the resulting glass frit mixture (see Col. 2, Lines 30-51). As noted in Col. 3, Lines 33-39, an improved glass frit bar and method for forming a glass frit bar with low amounts of impurities is a purpose of this patent.

Narayanan, et al.'s solution is to teach an extrusion process for forming the sealing material bar to eliminate the need for the ball-mill grinding, and thereby lowering the level of organic contaminants (see Col. 4, Lines 21-28). As can be seen from the patent specification, the preliminary issues of completely forming the face plate and the back plate is only disclosed in a

cursory manner and only shown as steps 201 and 202 in Figure 2. The prime teaching, as shown for example in the flow chart of Figure 1A and 1B of the Narayanan, et al. reference is the manner in which the glass frit is prepared to provide the sealing material and to extrude it to lessen the contaminant content.

Referring again to Figure 2, a glass frit slurry of the type prepared in Figure 1A, can be deposited as a sealing material bar around the appropriate edges of the face plate or the back plate. Tack posts can maintain a desired spacing between the back plate and the face plate, and the assembled display can be heated in an oven for approximately 1/2 hour. Alternatively, microwave heating can be utilized. As noted in Col. 9, Lines 57-67, a laser can supplement the heating of the glass and, to prevent oxidation, it is even noted that an inert gas, such as nitrogen, could be provided.

Such a production method does not address the issues of baking the phosphors while the front and back substrates are disposed to face each other and in which gases, water, and the like could be released, along with the burning gases generated, whereby both the phosphors and the protective layer composed of MgO could be exposed to high temperature, high density gases. It also does not address the issue of the oxygen that may be required for a burnout through the introduction of a dry air during the baking step in the furnace.

As can be determined from our specification, we can use a relatively low partial pressure of water vapor in dry air and this is particularly effective to prevent the deterioration of the blue phosphors. Features such as this are set forth in dependent claims that are certainly neither recognized nor addressed in the teachings of the Narayanan, et al. reference. The flow rate of the dry gas supplied to the internal space, as set forth for example in dependent Claims 8 and 9, is

further defined on page 25 of our specification. Again, the Narayanan, et al. reference does not teach these dependent claim features.

The present invention further sets forth examples in the manufacturing of PDP's and defines the preliminary baking temperatures and glass softening temperatures, as well as the phosphor baking and panel bonding temperatures that are neither addressed nor taught in the Narayanan, et al. disclosure.

In summary, 35 U.S.C. Section 102 requires that each and every element be disclosed in a cited reference. The Office Action cited, for example against Claim 1, steps 101-103 as teaching a pre-baking of a phosphorous layer. Steps 101-103, however, simply teach the grinding of a glass frit and an organic compound to form a sealing material (see Figure 1A). Step 160 further simply teaches an aging and removal of air from the glass frit/organic compound mixture (see Figure 1B and Col. 7, Lines 26-29). Steps 104-107 teach extruding lengths of sealing material and cutting it to a particular shape. Step 120 is an alternative embodiment of Figure 1B for cutting extruded lengths of sealing material with joining features. Step 108 is again a grinding of the sealing material bar to an actual dimension or size that is required. Finally, Steps 191-195 again are directed to producing the sealing material of the glass frit compound, and more particularly, to provide it in a hollow rectangular shape (see Step 191 in Figure 1C).

The Narayanan, et al. reference does not teach the claim elements as set forth in our present claims, but rather teaches a purported method of providing a glass frit having low contaminants by extruding the same.

In view of the above comments, it is respectfully requested that a re-consideration be made of the outstanding claims and an early notification of allowance be issued.

If the Examiner believes a telephone interview will help further the prosecution of the case, he is respectfully requested to contacted the undersigned attorney at the listed telephone number.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on December 12, 2002.

By: Marc Fregoso

Signature

Dated: December 12, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The last paragraph on Page 15 has been amended as follows:

In the present embodiment, the frit preliminary baking process, phosphor baking process, bonding process, and exhausting process are performed [is] in succession.